Nevada NASA Space Grant Consortium
Nevada System of Higher Education
Christian H. Fritsen
(775) 673 7487
URL: http://www.nvspacegrant.org/
Grant Number: NNX10AJ82H

PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The Nevada NASA Space Grant Consortium is a Capability Enhancement Consortium funded at a level of $660,000 for fiscal year 2010.

PROGRAM GOALS

The overall goal of the Nevada NASA Space Grant Consortium is to create and expand opportunities for Nevada students and faculty to be active and valued participants in our Nation's NASA aeronautics and space programs. NVSGC meets its general goal by implementing programs within Nevada that target the following objectives:

Objective #1: Recruit: We will a) recruit, train and reward scholars and fellows within all of our academic institutions, b) strive to ensure that they are representative of our state's population, and c) engage faculty and students at all NSHE institutions such that they acknowledge and promote successes of scholars and fellows in ways that enhance employment in STEM careers.

Objective #2: Support and Guide: NVSGC will develop new avenues for NASA research projects in Nevada that will ultimately result in new publications or research proposals to NASA.

Objective #3: Develop Curricula: Establish new courses and infuse NASA-related content within the NSHE institution's curricula.

Objective #4: Engage: Engage students in internships and academy positions at Industrial Affiliates and NASA centers.

Objective #5: Compete: Conduct curricular and extracurricular programs where multiple students are involved in hands-on science or engineering activities with an emphasis on the development of teams that compete in science and engineering competitions rooted in NASA-relevant and real world problems.

Objective #6: Promote STEM materials: Promote and increase the awareness and availability of NASA content-based STEM materials among teachers so that they can effectively integrate these in their future teaching endeavors.

Objective #7: Promote STEM literacy: Promote STEM literacy and increase awareness and perceived importance of NASA's missions through NVSGC activities.

PROGRAM/PROJECT BENEFIT TO OUTCOME (1, 2, OR 3)

Anecdotes illustrating contributions to Outcome 1:

Steven Wood (UNR NVSGC-funded student) worked at the Jet Propulsion Laboratory assisting Paolo Bellutta (a senior scientist in the Mobility and Robotics section here at JPL) on various tasks associated with the Mars Exploration Rovers Spirit and Opportunity, and the upcoming Mars Science Laboratory Curiosity. Steven has since moved on to work on the Mars Terrain Classifier using JPL resources.

Leah Preston (UNLV NVSGC scholar) accepted an internship at Chevron's Richmond, CA refinery as a Designs Engineering intern.

Kelly Robertson (UNLV, NVSGC fellow) presented her research at the State of the Arc (SOTA) meeting in Greece (September 2010) to scientists specializing in arc volcanism.

Gabe Herz (UNR NVSGC-scholar) created a stop-action movie for NASA at KSC entitled "Preparing Robonaut 2 for Space Flight." Gabe initially was a Nevada resident and scholar and has since worked as an intern and independent contractor for NASA.

Anecdote illustrating contribution to Outcome 2 and 3:

NVSGC supported a High School Moon buggy team from Reno that competed in the National Moonbuggy team competition in Alabama and they received rookie of the year status at the national level. All members of this team are seeking higher education degrees in sciences and engineering and also are participating in recruiting activities at UNR targeting engineering students and presented at middle schools in Reno (Dilworth) as well at the Fleischmann planetarium as well as Nevada Space day in Carson city.

PROGRAM ACCOMPLISHMENTS

Outcome 1:

Fellowships and Scholarship Programs (Objective #1 -*1a. We will recruit, train and reward scholars and fellows within all of our academic institutions. 1b. We will strive to ensure that they are representative of our state's population.1c. We will engage faculty and students at all NSHE institutions such that they acknowledge and promote successes of scholars and fellows in ways that enhance employment in STEM careers*): Seven (7) Fellowships, for a total of $93,750, were awarded to graduate students in Environmental Engineering, Geology, Mechanical Engineering, Astronomy, Geochemistry, Astronomy and Physics graduate programs at both the University of Nevada Reno (UNR) and the University of Nevada Las Vegas (UNLV). Twenty-three (23) Scholarships, for a total of $72,500, were awarded to students in Aviation Technology, Civil Engineering, Computer Science, Electrical Engineering, Geological Engineering, Geology, Hydrogeology, Mathematics, Mechanical Engineering, Physics and Astronomy at UNR, UNLV, the College of Southern Nevada (CSN) and Western Nevada College (WNC). Additionally, eleven (11) STEM Academic scholarships, for a total of $13,750, were awarded to students in the Colleges of Education, Engineering and Sciences at UNR and UNLV. The ratio of awardees to applicants was 9:17 for Fellowships and 23:31 for Scholarships in these statewide competitions. The STEM Academic Scholarships are selected by the Colleges of Science, Engineering and Education at NSHE institutions using basic NVSGC criteria, as well as their own competitive process. Smart objective 1a was nearly

reached. The number of awards going to students from underrepresented groups was 19%, which is slightly less than program's target of 26% and the number of awards going to women was 44%, which is less than the program's target of 53% women. The fellowship and scholarship program continues to be run through a state-wide competitive process.

Higher Education Programs (Objectives #4 - *Engage students in internships and academy positions at Industrial Affiliates and NASA centers,* **and #5** - *Conduct curricular and extracurricular programs where multiple students are involved in hands-on science or engineering activities with an emphasis on the development of teams that compete in science and engineering competitions rooted in NASA-relevant and real world problems*): NVSGC allocated resources to support 10 NASA internships during the summers of 2010 and 2011. During the summer of 2010, Gabe Herz created a stop-action movie for NASA at KSC entitled "Preparing Robonaut 2 for Space Flight" which can be viewed on our NVSGC website. The three other internships from summer 2010 are; 1) Marvin Smith, Intelligent Robotics Group, NASA Ames, advisor - Dr. Ara Nefian, Project Title: Image Search and Retrieval of Planetary Images, 2) Joshua Gleason, Intelligent Robotics Group, NASA Ames, advisor - Dr. Ara Nefian), Project Title: Pipeline Threat Detection and 3) Steven Wood, NASA JPL, advisor- Paolo Bellutta), Project Title:Mobility & Robotics for the Mars Rovers. All three were asked back after being sponsored by NVSGC during 2010. Joshua Gleason had a conference paper accepted for publication (based on the work that he did during the 2010 summer internship at NASA Ames): Joshua Gleason, Ara V. Nefian, Xavier Bouyssounousse, Terry Fong and George Bebis, "Vehicle Detection from Aerial Imagery", IEEE International Conference on Robotics and Automation (ICRA11), Shanghai, China, May 9-13, 2011. Marvin Smith also had a conference paper published in December 2010 (based on the work he did during the 2010 summer internship at NASA Ames): Marvin Smith, Ara Nefian "Outlier Removal in Stereo Reconstruction of Orbital Images," ISVC'10, Lecture Notes of Computer Science, vol. 6455 2010, pages 181-188. Marvin Smith and Joshua Gleason returned to NASA Ames to continue their research in summer 2011, along with Zachary Littlefield. Gabe Herz is interning during summer of 2011 at NASA JPL with his advisor Chris McQuin,working on the ATHELETE rover. Seth Gainey, a graduate student from UNLV is also interning at JPL and Josh Aurich is at NASA Goddard.

NVSGC continues to support several training programs to enhance extracurricular and curricular experiences through hands-on training and event-based activities that promote teamwork and enhance the types of training that are extremely relevant to NASA and the STEM workforce. Specifically, NVSGC has continued its nationally-known and respected balloon-Sat program collaboratively run by Drs. E. Wang and J. LaCombe at UNR along with faculty from NSC (S. Thanki) and TMCC (D. Loranz). This program has evolved over the past years and now engages students and faculty from across the state, specifically through the implementation of activities at Nevada State College, in conjunction with the NASA Spaceward bound camp (run by C. McKay in the Mohave Desert), and with the Davidson Academy of Nevada in Reno (a free public school for profoundly gifted middle and high school students from across the nation).

NVSGC has continued its tradition to develop local systems' controls and engineering competitions through its *Lighter Than Air Vehicle* competition at Truckee

Meadows Community College where student's compete by building a remote controlled balloon vehicle capable of meeting design criteria, as well as compete in a timed obstacle course. This competition has resulted in the participation of 3-8 teams of community college students and has engaged both the administration and the TMCC Foundation in the program. In addition, NVSGC has supported extracurricular training and promotion of NASA programs through the development of an initial student-based training program in conjunction with the Robotics and Vision researchers at NASA Ames. This program has led to students working at NASA Ames and JPL on robotics and vision research, as well as having NASA researchers visit NSHE campuses. This is an ongoing program and directly engages NSHE students and faculty through participation in courses, seminars, international symposia, internships and senior design projects.

NVSGC continues to build on these programs for the expansion of the BallonSat and Visualization programs (contributing to outcome 1) as well as the development of a hands-on engineering course for high school and middle school teachers (which contributes to Education outcome 2 and SMART objectives 5, 6 and 7

Curricula Development (Objective #3 - *Establish new courses and infuse NASA-related content within the NSHE institution's curricula. Specific targets include interdisciplinary classes utilizing or implementing mission directorate content as well as senior design courses and senior research projects*): Four curricula development proposals were funded through our statewide solicitation and review process. Proposals funded include a new introductory course in climate change offered at Nevada State College, an enhancement to the computer science Environments course offered at the University of Nevada Las Vegas, a lab course to complement the Physics 117 course at Truckee Meadows Community College, and a program at the University of Nevada Reno working with secondary education students to enhance their academic learning infused with STEM curriculum awareness through education related topics. These new courses when implemented will contribute to our SMART objective 5.

Research Infrastructure Programs (Objective #2 - *NVSGC will develop new avenues for NASA research projects in Nevada. The objective is to facilitate grant workshops, create new NASA contacts, and implement small seed research programs that will ultimately result in new publications or research proposals to NASA*): NVSGC is implementing three research infrastructure development programs with 2010 resources that were selected through a state-wide open competition process. These research programs seek to conduct research across a variety of disciplines - thus enhancing the multidisciplinary nature of the NVSGC program, as well as promoting targeted areas of opportunity that compliment ongoing efforts, or may be developed in the future as major institutional areas of research. Specifically, the NVSGC program is now conducting research targeting the alteration of clay minerals that may provide insights into these processes on Mars (UNLV), the development of microfluidic diagnostic devices for use in microalgal technology developments (UNR) and the generation of dielectric recombination data processing approached for better analysis of photo-ionized cosmic plasmas (UNR). All of these programs seek to develop the research that will culminate in the submission of proposals to NASA in the Science Mission Directorate (Astrophysics and Mars fundamental Analysis programs) and in anticipated ESMD or future energy or

life support solicitations.

Outcome 2:
Pre-college Programs (Objective #6 -*Promote and increase the awareness and availability of NASA content-based STEM materials among pre-service teachers so that they can effectively integrate these in their future teaching endeavors*): NVSGC solicited proposals and conducted reviews for both Pre-College and Informal Education programs and have funded two Pre-College and four Informal Education proposals. Proposals funded for Pre-College include a course at Western Nevada College in teaching STEM fields for pre-educators, with particular emphasis on activity based teaching. This course is expected to draw about 24 students. Also funded is a proposal from the University of Nevada Reno to fund education majors' involvement in a space habitation program.

Outcome 3:
Informal Education Programs (Objective #7 -*Promote STEM literacy and increase awareness and perceived importance of NASA's missions through NVSGC activities*): Proposals funded for Informal Education include a program for school-age children at the College of Southern Nevada to teach physics through the use of models of Leonardo da Vinci's airplane, which is expected to serve about 30 students. Also funded is a six-week astronomy course at Nevada State College using Sloan Sky Survey Data and is expected to serve about 15 students, an outreach program at UNR aimed at grades six through eight to increase participation in their Challenger and Planetarium program, and an outreach program from the Challenger Center of Northern Nevada aimed at K-12 to increase participation in their space-related programs.

NASA Education Priorities

In FY10 NVSGC ran several programs that included hands-on student activities with experiences rooted in NASA-related issue. Specifically, active hands on activities were evident in the NevadaSat balloon program conducted in several areas across the state and in conjunction with the NASA Spaceward bound program at Zzyzzx in the Mojave Desert near Baker, CA, the visualization program at UNR that included activities at JPL and ARC, as well as the lighter than air vehicle competition at TMCC which continued in its second year.

NVSGC currently includes all community colleges in Nevada and we continue to strengthen programs at these colleges. All Nevada System of Higher Education (NSHE) colleges have representation through the participation of campus Associate Directors in developing the ongoing goals for the consortium. Moreover, the community colleges have used FY10 resources for the development of hands-on training activities (e.g. by participating in the BallonSat program), curricula development (a physics classes at TMCC), informal education programs at CSN and NSC (on astronomy and the physics of Leonardo daVinci's machines) as well as activities aimed at precollege education at CSN and WNC. Many of these programs are new developments and continue to strengthen the consortium by getting activity-based programs on the college campuses.

During FY10, NVSGC conducted planning meetings for updating the consortium's strategic plans, goals and objectives. Specifically addressed was the need for NVSGC to utilize resources to implement programs that take advantage of NASA assets for

evaluating climate change and its effects on ecological systems and resources in the state (e.g. water and power). NVSGC FY10 resources have since been competed and awarded to programs emphasizing Environmetrics and the development of sensor networks, atmospheric sciences and ballooning programs. These activities complement earlier work throughout the consortium that targeted remote sensing of soil moisture as well as the alteration of desert surfaces and clay minerals relevant to understanding climate's effects on soil properties.

The consortium has come close to meeting its diversity goals both in terms of diversity of students and diversity of institutions. All eight of NSHE institutions have received resources for participating in consortium. Four of the eight institutions' students received scholarship or fellowship awards in FY10, which is a drop from the number in FY09 due to awarding all scholarships in a state-wide competition. Diversity among participants is being met through our consortium network that includes Hispanic engineering clubs as well as the Society Black engineers on institutional campuses. We have reached 48% women and 25% underrepresented students, near our targets of 50% and 26% for the overall program.

The NVSGC Research Infrastructure program has recently funded three faculty members in their early careers, including faculty from UNR and UNLV in small research development awards. The consortium director also worked with these faculty to find additional funding avenues for their research through consultations about NSPIRES, ROSES and ESMD opportunities.

PROGRAM CONTRIBUTIONS TO PART MEASURES

- Longitudinal Tracking: Total significant awards = **48**; Fellowship/Scholarship = **41**, Higher Education/Research Infrastructure = **7**; **8** of the total awards represent underrepresented minority F&S funded students (20%); **38** students are still enrolled in their current degree program, **8** have graduated and are pursuing an advanced STEM degree, **2** have graduated and are seeking STEM employment.
- Course Development: NVSGC is developing four new courses that infuse and utilize NASA content for enriching STEM training.
- Matching Funds: All NVSGC proposals provide the required matching funds through university, institutional, or industry match when appropriate, as well as through general funds from the state. We have matched the federal support of $660,000 by providing $121,107 in match contribution from the lead institution, the Nevada System of Higher Education and the balance of $358,893 was provided by the institutions and affiliates by matching their program management funds as well as competed individual awards (e.g. BallonSat, curricula development awards, etc..).
- Minority-Serving Institutions: The University of Nevada, Las Vegas and College of Southern Nevada have large populations of minorities, yet do not qualify as a MSI because the minority students as a whole do not constitute at least 50 percent of the total undergraduate enrollment. This is being revalued in 2012 as student enrollment has increased for both campuses.

IMPROVEMENTS MADE IN THE PAST YEAR

A Consortia-wide Associate Director began duties on October 12, 2010.

A business and strategic planning meeting was held August 19, 2010 with representation from NSHE institutions, industrial affiliates and program staff. The meeting was facilitated by Concur (an independent planning consultant). The meeting provided direct feedback and a quorum for the consortium to move forward with an implementation plan. The plan details strategic areas of the program. Emphases includes research on climate change using NASA assets, as well as the strategic development of systems engineering programs, while recognizing Nevada's continued support for programs in Astrophysics, Astrobiology and Planetary Geology and Geophysics.

Our Longitudinal Tracking efforts have improved by instituting our own in-house tracking system. These improvements have increased our reporting accuracy by eliminating duplicates and ensuring all reported counts are supported.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

NVSGC has eight member higher education learning institutions across the state, including: the University of Nevada, Las Vegas (UNLV); the University of Nevada, Reno (UNR); the Desert Research Institute (DRI); the College of Southern Nevada (CSN); Great Basin College (GBC); Truckee Meadows Community College (TMCC); Western Nevada College (WNC), and Nevada State College (NSC). Campus Associate Directors in conjunction with the program coordinator, program assistant and two NSHE research administrators comprise an internal advisory committee that aids in setting yearly operational goals and aims. The Director of the Nevada NASA Space Grant/EPSCoR Program reports to the Vice Chancellor and the Nevada System of Higher Education's (NSHE) Research Affairs Council. Thus, the consortium operations are run as a system-wide program with those with higher education interests represented.

The Consortium also has several industry and education partners. Digital Solid State Propulsion (Reno, NV), Equipment Links Inc. (Las Vegas, NV). Sierra Particle Technologies (Reno, NV) and Summit Products (Minden, NV) were active industry partners in 2010. The Challenger Center of Northern Nevada, Fleischman Planetarium & Science Center, Jack C. Davis Observatory at WNC and K-12 Washoe County School District's Science Program Coordinator form the present consortium education partners. The industrial and educational partners' roles in the consortium lie mainly in implementing internship opportunities as well as informal education and precollege programs. They also are invited and participate in planning and operations and aid in communicating and facilitating NASA program opportunities.

Respectfully submitted,

Christian H. Fritsen

Revision Submitted 07/18/2011